INSHOT BURNER

FIELD OF THE INVENTION

[0001] The present invention relates to inshot burners and more particularly an inshot burner with an improved construction.

BACKGROUND AND SUMMARY OF THE INVENTION

[0002] Inshot burners are used to blend a mixture of air and a gaseous fuel to present a combustible product for ignition and flow through a heat exchanger employed in a furnace for heating air. The inshot burner utilizes a mixing tube arranged in conjunction with a nozzle for supplying a gaseous fuel so that the energy in the gaseous fuel is used to induce a flow of air from the ambient into the tube in proportions designed to provide a desired mixture of fuel and air.

[0003] Inshot gas burners, such as used in furnaces, typically include a venturi tube which diverges from its input end to an enlarged output end. In some constructions, a burner head insert made of sintered or powered metal having outlet openings is mounted in the outlet end of the tube. In operation, gas is injected into the inlet end of the burner entraining air into the burner with it. This primary air/gas mixture flows through the tube to the burner head or flame retention insert. The primary air/gas mixture passes through the insert and burns as it exits the insert forming a cone of flame projecting from the outer face.

[0004] Some of the problems associated with conventional inshot burner designs are flame stability and noise. The velocity of the primary air/gas flow from

the insert is often greater than the flame speed. Under this condition, the flame lifts off from the burner insert; i.e., the flame begins to burn in mid-air at a location spaced from the outer face of the flame retention insert. Flame lift-off is a major cause of noise associated with the operation of inshot burners. If the velocity of the air/gas mixture is too slow when compared to the flame speed, flashback can occur. Flashback is the burning of the gas within the burner nozzle itself. This condition can cause overheating and deterioration of the nozzle. Another key aspect of burner design is burning efficiency or the ability to achieve more complete combustion of the gas/air mixture. An increased performance of more complete combustion also leads to reduction in emissions of CO and NOx.

[0005] Accordingly, the present invention provides an improved inshot gas burner which is designed to increase the efficiency of combustion and to operate quieter than conventional inshot burners. In addition, the improved design reduces overall manufacturing costs while allowing a more ordered flame pattern that serves to control secondary air entrainment and to allow for more complete combustion of the gas/air mixture.

[0006] Further areas of applicability of the present invention will become apparent from the detailed description provided hereinafter. It should be understood that the detailed description and specific examples, while indicating the preferred embodiment of the invention, are intended for purposes of illustration only and are not intended to limit the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The present invention will become more fully understood from the detailed description and the accompanying drawings, wherein:

[0008] Figure 1 is a side view of the inshot burner according to the principles of the present invention;

[0009] Figure 2 is a top view of the burner body utilized in the inshot burner according to the principles of the present invention;

[0010] Figure 3 is a side view of the burner body shown in Figure 2;

[0011] Figure 4 is an end view of a disc-like nozzle insert which forms part of the nozzle assembly according to the principles of the present invention;

[0012] Figure 5 is a side view of the disc-like nozzle member of Figure 4;

[0013] Figure 6 is a side view of a nozzle tube which forms part of the nozzle assembly of the present invention;

[0014] Figure 7 is an end view of the nozzle tube shown in Figure 6;

[0015] Figure 8 is a side view of the mounting bracket assembly according to the principles of the present invention;

[0016] Figure 9 is a top view of a bottom bracket of the mounting bracket assembly;

[0017] Figure 10 is a front view of the bottom bracket shown in Figure 9;

[0018] Figure 11 is a side view of the bottom bracket shown in Figure 9;

[0019] Figure 12 is a top view of the top bracket of the mounting bracket assembly shown in Figure 8;

[0020] Figure 13 is a side view of the top bracket shown in Figure 12; and

[0021] Figure 14 is a front view of the top bracket shown in Figure 12.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0022] The following description of the preferred embodiment(s) is merely exemplary in nature and is in no way intended to limit the invention, its application, or uses.

[0023] With reference to Figure 1, an inshot burner 10, according to the principles of the present invention, is shown. The burner 10 has five component parts that make up the complete assembly. A burner body 12, as best illustrated in Figures 2 and 3 is fabricated from a one inch illuminized tube having a 0.065 inch thickness wall. An inch and a half from the back of the tube 12, a reduced diameter portion 14 is provided to create a special shape for the air intake 16. A bead 18 is formed on opposite sides of the burner body in the area of a reduced diameter portion 20. The beads 18 are used to locate the burner body 12, as will be described in greater detail herein. The back of the tube 14 is formed to locate the back of the burner 10 over an orifice that feeds gas to the burner and also forms a window for the primary air intake.

[0024] The outlet opening 22 at the second end of the burner body is expanded outward to approximately 1.25 inch in diameter and is provided with a depth of approximately 0.2 inch to make a seat portion 24 for holding the burner nozzle assembly 26. Two port holes 28 are located approximately 0.325 inches from the front of the burner on each side to supply the gas for cross-lighting between the burners.

[0025] The burner nozzle assembly 26 includes a disc-like member 30, best shown in Figures 4 and 5 and a nozzle tube 32, best shown in Figures 6 and 7. The disc-like plate 30 is received in the seat portion 24 in the opening end of the burner body 12. The disc-like member 30 is preferably made from powdered metal and is approximately 0.25 inch thick having a 1.25 inch diameter. The center of the nozzle has a 0.63 inch diameter hole 34 for receiving the nozzle tube 32 therein. There are 12 0.156 inch diameter holes 36 spaced around the perimeter of the center hole 34.

[0026] The nozzle tube 32 has an upstream end portion 32A provided with a larger diameter than a downstream end portion 32B. The nozzle tube 32 is shaped in position in such a manner that when assembled to the nozzle plate 30, the nozzle allows the burner to be specifically tuned for different applications to reduce NOx generation. The increased diameter portion at the upstream end 32A and reduced diameter portion 32B at the downstream end of the nozzle tube 32 lowers the velocity of gas and air mixture going to the outer ports 36. The design makes the burner operation quieter and stops lift-off and lowers emissions from the burner.

[0027] A pair of mounting brackets 40, 42 are formed to fit the contour of the burner body 12. As best shown in Figures 9-11, the bottom bracket 40 has locating slots 44 provided in the radially extending flange portion 46 to locate the burner 10 to a burner box (not shown). The bottom bracket 40 has a lip 48 defined by a turned up flange in front of the bracket 40 which extends over to the nozzle tube 32 and helps the burner to operate quieter and eliminates lift-off. The flange portion 46 creates a pocket 50 between the top and bottom bracket 42, 40 that directs the

gas from the side ports 28 of the burner body 12 to create chain lighting. The top bracket 42 has a pair of radially extending flange portions 52 each provided with a raised portion 54 which, along with the flange portions 46 of the bottom bracket 40 define the pockets 50.

[0028] During assembly, the nozzle tube 32 is inserted in the opening 34 of the disc-plate member 30. Depending upon the specific intended application of the burner 10, the nozzle tube 32 is specifically located within the opening 34. In particular, it has been found that for different applications, the location of the nozzle tube 32 can be specifically tuned to increase the burner efficiency and reduce emissions. Accordingly, the axial position of the nozzle tube 32 relative to the nozzle plate 30 can be specifically determined for optimum efficiency and reduced emissions for different applications. Nozzle assembly 26 is then assembled in the outlet opening 24 of the burner body 12, and the brackets 40, 42 are assembled to the burner body 12 and projected welded in place. The lips 48 of the bottom bracket 40 extend radially inward and engage the nozzle tube 32.

[0029] The description of the invention is merely exemplary in nature and, thus, variations that do not depart from the gist of the invention are intended to be within the scope of the invention. Such variations are not to be regarded as a departure from the spirit and scope of the invention.